

What is claimed is:

1. A method for providing IP-VPN services, comprising:
exchanging unique loop-back addresses of customer edges (CE) between
5 said CEs via a respective data virtual circuit therebetween;
sending IP addresses of customer networks associated with each CE to an
associated IP service controller (IPSC);
broadcasting from said associated IPSC, said IP addresses of said
associated customer networks to other IPSCs;
10 sending, from each CE to an associated IPSC, a list of received loop-back
addresses;
sending, from each IPSC to an associated CE, customer network addresses
received from other IPSCs; and
populating, at each CE, a local routing table with information mapping said
15 customer networks with a data virtual circuit.
2. The method of claim 1, wherein prior to said sending said IP addresses of
customer networks, said method further comprises:
assigning a unique loop-back addresses to each CE.
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3. The method of claim 2, wherein said loop-back addresses comprise an IP
address.
4. The method of claim 1, wherein said sending IP addresses of customer
25 networks associated with each CE to an associated IPSC further comprises
excluding a loop-back address of said sending CE.
5. The method of claim 1, wherein said sending IP addresses of customer
networks to an IPSC are sent over an out-of-band control virtual circuit.

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6. The method of claim 1, wherein said broadcasting said IP addresses to other IPSCs comprises distributing said IP addresses over an mp-iBGP routing protocol path.
- 5 7. The method of claim 1, wherein said broadcasting from said associated IPSC to other IPSCs further comprises broadcasting a VPN specific identifier and a next-hop-attribute set to the loop-back address of said CE associated with said IPSC.
- 10 8. The method of claim 1, wherein said sending, from each IPSC to an associated CE, customer network addresses received from other IPSCs comprises sending those customer network addresses that have loop-back addresses in said list provided by the associated CEs.
- 15 9. Apparatus for providing IP-VPN services, comprising:
means for exchanging unique loop-back addresses of customer edges (CE) between said CEs via a respective data virtual circuit therebetween;
means for sending IP addresses of customer networks associated with each CE to an associated IP service controller (IPSC);
20 means for broadcasting from said associated IPSC, said IP addresses of said associated customer networks to other IPSCs;
means for sending, from each CE to an associated IPSC, a list of received loop-back addresses;
means for sending, from each IPSC to an associated CE, customer network
25 addresses received from other IPSCs; and
means for populating, at each CE, a local routing table with information mapping said customer networks with a data virtual circuit.
10. The apparatus of claim 9, wherein said means for sending said IP
30 addresses of customer networks, said apparatus further comprises:

means for assigning a unique loop-back addresses to each CE prior to said sending said IP addresses.

11. The apparatus of claim 10, wherein said loop-back addresses comprise an
5 IP address.

12. The apparatus of claim 9, means for sending IP addresses of customer
networks associated with each CE to an associated IPSC further comprises means
for excluding a loop-back address of said sending CE.

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13. The apparatus of claim 9, wherein said means for sending IP addresses of
customer networks to an IPSC are sent over an out-of-band control virtual circuit.

14. The apparatus of claim 9, wherein said means for broadcasting said IP
15 addresses to other IPSCs comprises distributing said IP addresses over an mp-
iBGP routing protocol path.

15. The apparatus of claim 9, wherein said means for broadcasting from said
associated IPSC to other IPSCs further comprises means for broadcasting a VPN
20 specific identifier and a next-hop-attribute set to the loop-back address of said CE
associated with said IPSC.

16. The apparatus of claim 9, wherein said means for sending, from each IPSC
to an associated CE, customer network addresses received from other IPSCs
25 comprises means for sending those customer network addresses that have loop-
back addresses in said list provided by the associated CEs.

17. The apparatus of claim 9, wherein said IPSCs are facilitated in one of a
switch and a server.

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18. The apparatus of claim 17, wherein each said IPSC comprises:

I/O interface means for providing physical connectivity to establish control virtual circuits between the CEs and associated IPSCs, and a routing control mp-iBGP path between said IPSCs;

5 a CE-IPSC communication protocol for provides BGP routing procedures for the control virtual circuits between said CEs and associated IPSCs;

a IPSC-IPSC communication protocol for providing mp-iBGP routing procedures for the routing protocol path between said IPSCs;

a CE-IPSC routing database for storing routing information for the control virtual circuits;

10 an IPSC-IPSC routing database for storing mp-iBGP routing protocol paths; and

means for providing interaction procedures between said I/O interface means, CE-IPSC communication protocol, IPSC-IPSC communication protocol, CE-IPSC routing database, and IPSC-IPSC routing database.

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19. The apparatus of claim 18, wherein said means for providing interaction procedures utilize information in the IPSC-IPSC routing database, in conjunction with the CE-IPSC protocol information and I/O interfaces, to determine routing information to be sent to the CEs and the associated IPSCs.

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20. A method for providing IP-VPN services, comprising:

receiving, at a customer edge (CE), unique loop-back addresses of other customer edges (CEs) via a respective data virtual circuit therebetween;

25 sending IP addresses of customer networks associated with said CE to an associated IP service controller (IPSC);

broadcasting from said associated IPSC, said IP addresses of said associated customer networks to other IPSCs;

sending, from said CE to said associated IPSC, a list of received loop-back addresses;

30 sending, from said associated IPSC to said CE, customer network addresses received from other IPSCs; and

populating a local routing table of said CE with information mapping said customer networks with a data virtual circuit.

21. The method of claim 20, wherein said sending IP addresses of customer
5 networks associated with said CE to an IPSC further comprises excluding a loop-back address of said CE.

22. The method of claim 20, wherein said broadcasting said IP addresses to
10 other IPSCs comprises distributing said IP addresses over an mp-iBGP routing protocol path.

23. The method of claim 20, wherein said broadcasting from said associated
IPSC to other IPSCs further comprises broadcasting a VPN specific identifier and a
15 next-hop-attribute set to the loop-back address of said CE associated with said IPSC.

24. A method for providing IP-VPN services, comprising:
exchanging unique loop-back addresses of customer edges (CE) between
said CEs via a respective data virtual circuit therebetween;
20 receiving, at an IP service controller (IPSC) associated with a CE, IP
addresses of customer networks associated with said CE;
broadcasting from said IPSC, said IP addresses of said associated
customer networks to other IPSCs;
sending, from said associated CE to said IPSC, a list of received loop-back
25 addresses;
sending, from said IPSC to an associated CE, customer network addresses
received from other IPSCs; and
populating a local routing table of said associated CE with information
mapping said customer networks with a data virtual circuit.

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25. The method of claim 24, wherein said sending IP addresses of customer networks associated with each CE to an associated IPSC further comprises excluding a loop-back address of said sending CE.
- 5 26. The method of claim 24, wherein said IPSC receives said IP addresses of customer networks associated with said CE from an out-of-band control virtual circuit.
27. The method of claim 24, wherein said broadcasting said IP addresses to
10 other IPSCs comprises distributing said IP addresses over an mp-iBGP routing protocol path.
28. The method of claim 24, wherein said broadcasting from said IPSC to other IPSCs further comprises broadcasting a VPN specific identifier and a next-hop-
15 attribute set to the loop-back address of said CE associated with said IPSC.